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AN

Inaugural Thesis

ON

INTRA-CAPSULAR FRACTURES

OF THE

CERVIX FEMORIS.

SUBMITTED TO THE PUBLIC EXAMINATION OF THE TRUSTEES AND FACULTY OF MEDICINE OF THE COLLEGE OF PHYSICIANS AND SURGEONS OF THE

UNIVERSITY OF THE STATE OF NEW YORK.

THOMAS COCK, M.D., PRESIDENT.

For the Degree of Doctor in Medicine,

March 12, 1857.

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BY JOHN GEO. JOHNSON,

OF THE STATE OF MASSACHUSETTS.  
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TO

JAMES R. WOOD, M.D.,

SURGEON TO BELLEVUE HOSPITAL; PRESIDENT OF THE NEW YORK
PATHOLOGICAL SOCIETY, ETC., ETC.

This Thesis is Dedicated,

As an humble tribute to that distinguished Surgeon for his noble endeavors to
elevate the Profession by his public teachings and private example, and
as a feeble acknowledgment of the debt of gratitude due to him
for the interest he has manifested in the advancement
of his pupils in professional information; by
one of his private pupils,

JOHN GEO. JOHNSON.

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On Intra-Capsular Fractures of the Cervix Femoris. *Smith by bone*

UNTIL within a few years, much diversity of opinion has existed upon this question. Lately, the preponderance of opinion has inclined strongly toward the affirmative. In the conviction, however, that it is an open question, we desire to submit to the profession the results of our investigation of the subject.

The first question which presents itself is—Can intra-capsular fractures be diagnosed with certainty *during the life of the patient?*

Fractures of the cervix femoris present themselves in three varieties:—1. Those entirely within the capsular ligament. 2. Those entirely without the capsular ligament. 3. Those partly within and partly without the capsular ligament.

The subjective symptoms are:—1. Pain. 2. Loss of voluntary motion. The objective symptoms are:—1. Swelling and deformity at the hip. 2. Approximation of the trochanter major to the anterior superior spinous process of the ilium. 3. Shortening. 4. Crepitus. 5. Eversion. 6. Formation of callus. 7. The direction in which the force is applied.

It is hardly necessary to refer to the first of the subjective symptoms as a means of diagnosis, for in all cases of fracture of the cervix femoris, there is more or less injury to and laceration of the soft parts—and, consequently, pain.

It is generally admitted that in all these cases the patient feels pain in the whole vicinity of the joint.

2. Loss of voluntary motion exists in all fractures of the cervix femoris where there is displacement, whether the fracture is within or without the capsule. The only exception is in cases of impacted fractures, where the shaft of the bone is driven into the cancellated portion of the head, in which cases the power of voluntary motion may still remain.

Of the objective signs, the amount of shortening *immediately* attendant on the injury has been insisted upon as the most conclusive in the diagnosis of intra from extra-capsular fractures.

Those that insist that they can distinguish between these kinds of fractures during the life of the patient, maintain that the amount of immediate shortening in the cases of

extra-capsular fractures is so much greater than in intra-capsular fractures, as to furnish conclusive evidence as to which class the fracture belongs. First, they maintain that immediate shortening is greater in extra-capsular fractures, from physiological principles; second, as a matter of experience. The physiological reason is, that the cervix femoris is surrounded by a capsular ligament, which, in health, is extremely powerful, and closely embraces the head and cervix; thereby preventing the shaft from slipping so far in intra as in extra-capsular fractures. If the capsule was in every case uninjured, this would be satisfactory; for it must be admitted that the capsular ligament is very strong, and acts powerfully in retaining the fractured parts in their places. If, however, the capsular ligament is torn, the shaft of the bone may slip through the rent, and thus afford an amount of shortening as great as in cases of fractures entirely without the capsule. All authorities admit that laceration of the capsule may, and often does, occur. Again, if the head of the femur is comminuted, shortening to an indefinite extent may occur. The head of the femur may be comminuted, as this fracture usually occurs in persons past the prime of life, when all the bones are fragile. Further, we can not diagnosticate oblique intra-capsular from transverse extra-capsular fractures, for it is quite impossible to feel the direction of the fracture, imbedded as it is. Again, the shock is sometimes so great as to cause a paralysis of the muscles, and in these cases the shortening does not immediately occur, even though the fracture be extra-capsular. The fracture may also be impacted, and yet extra-capsular. In these cases there will not be as much immediate shortening, as is claimed for all cases of extra-capsular fractures.

From these considerations, we conclude that unless the condition of the capsule, or the precise nature of the fracture can be determined, the amount of shortening is not a diagnostic mark to be relied on.

2. *Opinion of Authorities.*—It is surprising to find the amount of difference among authorities upon this point. The most eminent surgeons, not of this country alone, but English, Irish, and French, hold directly opposite opinions.

Sir Astley Cooper says, that intra-capsular fractures gives the greatest amount of shortening. Mr. Stanley is *opposed to him*. He states that extra-capsular fractures have the greatest shortening. Amesbury claims the greatest shortening for intra—and Earle, for extra-capsular fractures. Robert

Wm. Smith, of Dublin, claims the greatest shortening for extra-capsular ; while Chassaignac, and Vidal, (de Cassis) are opposed to Desault, Boyer, Dupuytren, and Cloquet.

How can these contradictory opinions be reconciled or harmonized ? Only by considering that, in some instances, the intra-capsular fractures have given the greatest amount of shortening, and in other instances the extra-capsular fractures give the greatest shortening ; and that the surgeons who have seen the cases of the first class, hold the opinion that extra-capsular shortening is the greatest ; while those who have seen cases of the second class, hold the opinion that intra-capsular shortening is the greatest ; accepting this, as the true explanation, and there is none other we can accept without charging either the one side or the other with ignorance or with intention to mislead, (neither of which charges we are willing to make,) we are compelled to conclude that this symptom does not present itself with sufficient regularity to be of weight as a diagnostic sign. This is the opinion entertained by the French Surgeon, M. Rodet, who says :—
 “ Cette opposition formelle entre les opinions de ces grands chirurgiens vient sans doute de ce qu’il n’y a rien de constant dans le degré du raccourcissement, qui accompagne de ces deux espèces des fractures.” With this difficulty, both in theory and in experience, we are compelled to exclude the amount of shortening as diagnostic of the character of the fracture.

Crepitus.—This will depend on two conditions : first, whether there is anything interposed between the ends of the bone, as muscle, capsular ligament, etc., to prevent the rubbing of the ends together ; second, whether there is impaction. If there is no impaction, and nothing interposed between the ends of the bones, there is no reason why crepitus should not occur, whether the fracture is intra or extra-capsular.

Eversion.—This will depend, if the fracture is intra-capsular, much on the amount of laceration of the capsule. If the capsule is lacerated, there is no reason why the foot may not be everted as fully as in cases of extra-capsular fractures. Until it is determined whether there is, or is not, laceration of the capsule, it is certain that we can not make the amount of eversion a diagnostic sign.

Again, if the fracture is extra-capsular and impacted, there may be as little eversion as in cases of intra-capsular fracture, where the capsule is not lacerated. So, whether we

have intra-capsular fracture with laceration of the capsule, or extra-capsular fracture without laceration; whether we have intra-capsular fracture without laceration, or extra-capsular fracture with impaction, we can not form a diagnosis from the eversion.

Callus.—It has been thought that the existence of callus furnished a means of diagnosis, because there would be no callus formed around the ends of the bone, if the fracture was intra-capsular. This is true; there is no callus formed *within* the capsule, but there is a *formation* of callus in cases of intra-capsular fracture. The callus is formed precisely where the law that governs plastic exudations would teach us to look for it, viz.: *external* to the capsule, where there are tissues capable of effusing it. It is effused *external* to the capsule precisely *where* it is effused in cases of *extra-capsular* fracture. This fact is beautifully shown in the specimen of intra-capsular fracture, now in the possession of Dr. William H. Van Buren, of this city. A minute description of which will hereafter be given. The simple formation of callus, therefore, can not be considered a diagnostic sign of extra-capsular fracture, as it may be found in the same place in both kinds of fracture.

Approximation of the Trochanter Major to the Anterior Superior Spinous Process of the Ilium.—This can not be a diagnostic sign, for there will be approximation in *every* case of fracture of the cervix, and the degree of approximation will depend on the direction of the fracture; an oblique fracture giving us more approximation than a transverse; and this rule will hold true, whether it is an intra or extra-capsular fracture.

Swelling and Deformity at the Hip.—This will occur in both cases; the amount of deformity depending on the direction of the fracture.

M. Rodet having come to the conclusion, that none of these signs were diagnostic, rejected them; and maintained that *the direction in which the force was applied* was the only diagnostic sign; and that the fracture will be intra or extra-capsular, oblique or transverse, according as the force has been received in a vertical, lateral, or transverse direction. Mr. Smith thus sums it up:

Force acting vertically,.....	Fracture will be oblique, and intra-capsular.
antero-laterally,....	transverse, and intra-capsular.
postero-laterally,...	mixed.
transversely,.....	extra-capsular.

Thus, if the person fell upon the knees, we should have the first class, oblique and intra-capsular ; and in regard to this argument, Mr. Smith, of Dublin, makes the following very just remarks : “ With respect to Rodet’s diagnostic sign, it will be admitted as a general principal, that the mode of application of the force and the direction in which it acts, will determine the situation and direction of the fracture ; but I contend that it is seldom available in practice in determining the seat of a fracture of the neck of the femur with respect to the capsule, for it would be extremely difficult, if not impossible, in the generality of cases, to obtain from patients a description of the direction in which the force was applied, as accurate as would be necessary before we could avail ourselves of it as a means of diagnosis. It is not probable that a person of advanced age, who had just suffered so severe an injury as fracture of the neck of the thigh bone, would be able to inform us whether the shock was sustained by the external surface of the trochanter, or whether there was a deviation anteriorly or posteriorly from a directly lateral fall.” (SMITH *on Fractures*, Page 21.) It might be quite impossible to determine the point of injury from an examination of the hip, as it may have been so protected by the clothes, that no ecchymosis occurred, or the contusion and ecchymosis may be so extensive as to lose all value as indications of the precise spot of the application of the force. Mr. Smith also gives an instance (page 21) in which, according to this rule, we should have an extra-capsular fracture, and in which dissection proved that the fracture was intra-capsular. So much for this diagnostic sign, beautiful in theory, but valueless in practice.

I have thus reviewed each of these symptoms of fracture. They are all extremely obscure, and the one upon which the greatest stress has been laid—*shortening*—must be excluded altogether. Taken separately, no one of them will enable us to form a diagnosis ; taken collectively, there are so many different conclusions that may justly be deduced from them, that no positive diagnosis can be given between the two kinds of fracture *during the life of the patient*.

If this difficulty attends the diagnosis of the two extreme classes of extra and intra-capsular fractures, still greater difficulty must attend the diagnosis of the third class, which is a mixture of the other two, partly intra and partly extra-capsular ; and when we come to diagnose this third class from the other two, it is impossible. As no accurate opinion

can be formed of the precise nature of the injury during the life of the patient, so no conclusion can be drawn as to the osseous or non-osseous union of fractures within the capsule from those patients who recover. This limits the decision of the question to the conclusions derived from an examination of post-mortem specimens.

Before entering on that question, it may not be improper to consider the probability of the osseous union of intra-capsular fractures, in the view of the anatomical and pathological conditions existing. The first point is the effect of the injury on the capsule.

Violence sufficient to fracture the cervix femoris, must be sufficient to cause injury to the synovial membrane of the capsule. The result of that injury will be inflammation of the synovial membrane, and the result of that inflammation will be the effusion of a superabundance of synovial fluid; or, if the inflammation continues long enough, of plastic lymph. Now, when the synovial fluid is poured out, there must be distention of the capsule by it, and if this occurs, then there must be separation of the ends of the bone, for they are attached to the capsule. If the ends of the bone are separated, we can not have osseous union; for even the most ardent advocate of osseous union (R. W. Smith, of Dublin) claims it only in cases of impacted fractures. Now, as long as the inflammatory action continues, so long shall we have synovitis, effusion, distention of the capsule, and consequent separation of the ends of the bone. If the inflammatory action ceases, we shall not have union by bone, for the first thing nature does is to get up an inflammatory action in and around the ends of the bone, whereby plastic exudation is poured out. That we do have synovitis in all cases of intra-capsular fractures is evident from the autopsies, for the capsule is always reported thickened. This thickening is evidently due to inflammation of the synovial membrane, so long continued that not merely synovial fluid had been effused, but plastic lymph, and that lymph had become organized.

2. There is no sufficient means left, after the fracture, to nourish the head of the bone, and furnish material for ossific union. The only possible means of nourishing the head of the bone, are four in number:—1. From the branches of the nutrient artery of the femur. 2. From the periosteum. 3. From the synovial membrane. 4. From the vessels of the ligamentum teres:—1. If the bone

is fractured, the probability is that the branches of the nutrient artery are torn from the head of the femur. 2. The periosteum will probably be torn, because it is the most delicate upon the head and cervix. 3. The synovial membrane would produce synovial fluid and lymph, but not ossific matter. 4. The vessels of the ligamentum teres are so small as to be imperceptible to the unassisted eye, and it is not possible that these should be able to carry a sufficient amount of nutrition to support the bone, and afford ossific union. Grant, for the sake of argument, that the vessels of the ligamentum teres were capable of performing this function. If they did perform it, they would become much enlarged from this increased action, in the same manner that the anastomotic vessels are enlarged in the case of a ligated artery; but in every one of these cases, of so-called osseous union, where the ligamentum teres has been spoken of, it has been described as *natural*. If it was natural, then its vessels could not have performed this increased function. If it was not natural, then the notes have not been *faithfully reported*.

3. Another difficulty in the way of osseous union is to be found in the difficulty of maintaining the ends of the bone in coaptation. Nature's splint does not work here; there is no provisional callus around the ends of the bone to maintain them in apposition. There is effusion into the capsule, so that no external splint can be applied which will be able to control the upper end of the fractured bone; for, if it is firmly applied, the pressure will increase the synovitis; if it is not firmly applied, it is of no use.

We conclude, therefore, that bony union of the intra-capsular fracture does not occur, for the following reasons:

1. The separation of the ends of the bone by the synovitis, which synovitis continues so long as there is inflammatory action in the part. 2. The lack of tissues capable of producing ossific matter. 3. The lack of means of nourishment. 4. The impossibility of retaining the bone in coaptation.

Before leaving this part of the argument, another point must be briefly considered, because some writers lay great stress upon it. It is the "Argument from Analogy;" or, the bony union of fractures of bones within synovial membranes, as in fractures of the patella and olecranon. This argument seems to many to be conclusive, and it is urged, as such, by men of eminence in their profession. A slight

examination will, however, show points of difference sufficient to destroy all analogy and all arguments derived from analogy. 1. The patella is not a part of the skeleton. It is a sesamoid bone developed in the tendon of the quadriceps extensor muscle, to afford this muscle greater leverage. 2. It is a flat bone, while the head of the femur is spheroidal. 3. It is more fully nourished than the head of the femur. The head of the femur, in cases of fracture, derives its nourishment entirely through the ligamentum teres, a small rounded tendon; while the flat, strong band of tendinous fibres, composing the ligamentum patella, passes over the entire length of the patella. This ligament is so large that it would be more fitly denominated the tendon of the quadriceps extensor muscle. The whole anterior surface is covered with synovial membrane, and there is a fold of synovial membrane reflected behind the patella, termed the ligamentum mucosum. The knee joint is the largest joint in the whole body, and the patella being a flat bone, there is a greater amount of surface in proportion to the size of the bone to receive nourishment from the synovial membrane and fluid, than is the case in the head of the femur. Again, the knee joint is more abundantly nourished than the acetabulum. We find five arteries of considerable size passing to the joint—so large as to be described by anatomists. They are the two upper articular arteries, the two lower articular arteries, and the middle articular artery. Of these, the middle branch or external articular artery, goes directly to the patella; and the lower internal articular artery sends branches directly to that bone. These five arteries form a net-work of vessels at the front and sides of the joint, so that the patella has an abundant supply of blood in cases of fracture—unless these vessels are destroyed. Most fractures of the patella occur from a sudden strain, rather than from direct violence, so that in the majority of cases there will be abundant nourishment to the fractured patella.

The olecranon has scarcely more analogy with the cervix femoris than the patella. Instead of being attached by a small ligament, like the ligamentum teres, there is the powerful ligament of the triceps extensor muscle—a tendon far more capable of supporting a bone as large as the head of the femur than the ligamentum teres. But it has no such work to perform. The olecranon has other and ampler sources of nourishment, being covered on one side by cartilage, and on the other by the synovial membrane of the joint. The synovial mem-

brance of the elbow joint is far larger, in proportion to the size of the olecranon, than is that of the hip joint to the size of the head of the femur. We regard it as established, therefore, that the prospects of union are far more favorable in cases of fracture of the patella and olecranon, than in cases of fracture of the cervix femoris. But what results are obtained in cases of fracture of the patella and olecranon? Almost invariably union by ligament. The union by bone is the exception, and so rare an exception that the specimens are preserved in museums, as curiosities. These reasons place the improbability of union beyond a reasonable doubt.

Again, the non-union of cases, where everything was favorable, affords a strong *probability* that union does not occur. I will quote two of these cases for illustration.

I am indebted to Dr. James R. Wood, of this city, for the following history, which he has kindly furnished me, of a case which occurred in his own practice, and I take great pleasure in acknowledging the favors I have received from him, both in the privileges of his museum and also in his library, and the facilities he has afforded me in the investigation of this subject:

Case 1.—History.—M. J., a young lady, æt. 16 years; of vigorous constitution; perfectly free from any constitutional taint either of scrofula, syphilis, or cancer; was caught between the wheels of two carriages, the one stationary, the other in motion. The blow was received directly on the trochanter major of the right side. The symptoms which presented themselves showed conclusively that there was a fracture. There was shortening, loss of voluntary motion, and eversion; by placing the finger on the trochanter major, and the thumb in the groin, a well-marked crepitus could be felt on extension and rotation being made. There was no laceration or other complication of the injury. She was placed on Amesbury's splint, with side splints accurately adjusted, and every precaution taken to ensure a perfect union. The limb was kept on this splint without being disturbed for six weeks. At the end of that time, it was taken from the splint, and examined with care. The signs of fracture still remained; the limb was replaced on the splint, and the dressings as before; everything was attended to in the general management of the case which the doctor thought would be conducive to perfect union. The patient was kept for three weeks longer on the splint, which was then removed. It was found that there was no union. Patient

lived for three years, and was so lame that she was always obliged to use a crutch in walking. At the expiration of three years she died of an acute disease.

Post-Mortem Examination.—On examination of the cervix femoris, it was found that there had been a transverse fracture of the bone just at the junction of the head and neck. The head of the bone was still attached to the acetabulum by the ligamentum teres. The process of absorption had been going on, and the head of the bone had already been absorbed below the level of the acetabulum, and what remained was soft and spongy, easily broken with the handle of the scalpel. The neck of the bone was rounded off, and covered with a fibrous deposit. This was not a case of diastasis, as has been suggested by an eminent surgeon, who judged simply from the age of the patient. She was full sixteen when the accident happened, and over nineteen when she died.

Remarks.—This case makes a very strong argument against union by bone. Here, every circumstance was favorable. The age of the patient, her constitution, the immediate diagnosis of a fracture, and the subsequent treatment, were favorable to osseous union, if it were possible that such union could take place under *any* circumstances where the fracture was within the capsule. She was not an old patient, past the prime of life, in whom the vital energies were nearly exhausted, as are most of the patients in whom osseous union is claimed to have taken place, but at the most vigorous period of life, just after ripening womanhood has given full strength and power to all her functions; a period when nature is prodigal in her endeavors to aid, and when her recuperative powers are the strongest. She was not broken down by constitutional disease, produced either by her own or her parents' errors, but in perfect health, free from *all* constitutional taint, either of scrofula, syphilis, or cancer.

There was no mistake in the diagnosis of the case, as in one of Mr. Smith's so-called cases of osseous union. Here the diagnosis was made at once, and made correctly. The treatment, also, was adapted to the nature of the fracture. The patient was at home, among her friends, where every wish of her attending surgeon could be carried out. And to those acquainted with the surgeon in attendance, his name alone would be a guarantee that everything requisite in the treatment was attended to, even had no mention been made of the dressings in the case.

Those dressings were Amesbury's splint, with side splints;

a form of dressing insuring perfect rest of the parts. These dressings were kept on for six weeks undisturbed, then the limb was carefully examined, dressings replaced, and continued for three weeks longer; everything, meanwhile, being attended to which the surgeon in attendance thought conducive to union. Under these most favorable circumstances for osseous union, this result was not obtained; the patient remained a cripple for life; the process of absorption of the fractured end of the bone went on, and at the time of her death the parts were found as already described. If this was the only case of the kind which could be adduced, then it might be regarded as a rare exception; but cases of the kind can be easily multiplied, quite as conclusive as that just mentioned.

There is in the museum of Prof. William H. Van Buren, of the University Medical College, a specimen precisely in point. I am under obligations to Prof. Van Buren for the history of the case, which he furnished me, and also for the privilege of fully examining the specimen.

Case 2.—History.—The patient was a man, æt. 25 years; robust; in good health. He was dancing at his sister's wedding; while cutting a pigeon wing, he struck the foot upon which he was resting from under him, and fell, striking directly upon the trochanter major. He was unable to rise; a carriage was called and he was taken directly to the New York Hospital. There he came under the charge of Dr. J. Kearney Rodgers. A fracture was immediately diagnosed, and for a few days he was kept on the double inclined plane. The straight splint was then used, and the dressings kept up for six weeks, at the end of that time they were taken down and the limb examined: there was no union. The limb was continued in the straight splints for three weeks longer, and again examined—there was still no union. The patient was again replaced in the straight splint for two weeks longer, but no union occurred. At the end of three months from his admission, he was discharged; he was in good health, but so lame that he was obliged to use two crutches in walking. After his discharge, the patient became very intemperate; and, in the course of a few weeks, he applied for admission to Bellevue Hospital. He was much debilitated, and had an exhausting diarrhoea. Shortly after his admission, an immense abscess formed over the joint, which discharged profusely. The man died shortly after, from exhaustion, and the specimen came into Dr. Van Buren's hands, the patient having been in his service. Dr. Van

Buren was aware of the patient's previous history, the treatment, etc., at the New York Hospital, and a careful examination was made.

Post-Mortem Examination.—The capsular ligament was destroyed entirely by the suppurative process; there was a formation of callus upon the trochanter major; the ligamentum teres was entirely absorbed; the head of the bone was spongy, as if worm eaten; the direction of the fracture was oblique, commencing just at the articulating surface of the head and ending just within the capsule; the upper end of the shaft of the bone showed this same appearance that was marked in the head. These points are beautifully shown in the specimen at the present time. The opinion of Charles E. Isaacs, M.D., the able Demonstrator of Anatomy of the University Medical College, is, that this fracture was entirely within the capsule.

Remarks.—Here was a strong, healthy man, in the prime of life, with no constitutional taint, with an immediate diagnosis of his fracture, and immediate and proper treatment, and that treatment continued for three months, under the supervision of Dr. J. Kearney Rodgers, with all the advantages of the New York Hospital, where more fractures are treated than in any other institution in this country; everything being attended to that would facilitate union. The patient's general health was carefully attended to as is shown by his condition at the time of his discharge. Notwithstanding all these advantageous conditions, there was no union. If health, constitution, youth, and good treatment give no such results, what are we to hope for from age and debility?

We shall now proceed to analyze the specimens which have been brought forward to prove the union of intra-capsular fracture of the cervix femoris. If there is a single specimen, about which there could be no doubt of there having been a fracture entirely intra-capsular, and of that fracture uniting by osseous union, that specimen would settle the possibility of osseous union in cases of intra-capsular fractures of the cervix femoris. But is there a single specimen of this kind in existence? Robert W. Smith, of Dublin, in his excellent work on *Fractures*, claims to have collected facts which settle this question. He has searched the museums of England, Ireland, and France, for their choice specimens, and has been able to collect only seven which have any pretense of this kind. Prof. Willard Parker, of this city, has

one; Philadelphia claims to have two; and Prof. R. D. Mussey, of Cincinnati, has three specimens, which he alleges are perfect illustrations of the osseous union of intra-capsular fractures of the cervix femoris.

The greatest number collected are in the work of Robert W. Smith, of Dublin, on *Fractures*; they are seven in number. The first of these cases is that of Mr. Langstaff's, which is the strongest case; the notes of this case, both as published in the *Medico-Chirurgical Transactions*, vol. 13, page 491, No. 242, and in Mr. Smith's work on *Fractures*, page 57, are extremely meagre. Mr. Smith's report is as follows (page 57):—"In this case, the patient was a female, æt. 50 years, when the fracture happened. She was confined to her bed for nearly twelve months after the occurrence of the accident, and during the remainder of her life, a period of ten years, walked with crutches. On dissection, it was found that the principal part of the neck of the bone was absorbed; the head and remaining portion of the neck were united, principally by bone, and partly by a cartilaginous substance. On making a section of the bone, it was evident that there had been a fracture of the neck within the capsular ligament, and that union had taken place by osseous and cartilaginous media. With a view of ascertaining whether there was real osseous union, the bone was boiled many hours, which, by destroying all the animal matter, satisfactorily proved the extent and firmness of the osseous connection, and exhibited the spaces which had been occupied by cartilaginous matter."

No mention is made of the treatment adopted in the case. The only statement that can in any way be considered as bearing on this point, is that she was confined to her bed for twelve months. This was probably because she could not get up, for if Mr. Langstaff had required her to be kept in bed, as a part of the treatment, he would doubtless have mentioned it. He does not state whether any splints were used, or any other means adopted to keep the parts in coaptation. These are important particulars; for Mr. Smith says (page 64) it is by contact and rest, that we are to hope for bony consolidation.

Again, all the proof of there ever having been a fracture must be derived from the statement of Mr. Langstaff; for there is not a single symptom, nor a single fact mentioned, to lead to such a conclusion, except that the woman kept her bed for twelve months after the accident, and was afterwards lame for life. Nor does he give us any reason where-

by he came to this conclusion from the autopsy. There are no measurements given to show how far within the capsule the fracture was; or, how near to the capsule the fracture approached at its nearest point of approximation. In fine, the capsule itself is not preserved, or even the smallest portion of it, from which to furnish points of measurements. Nothing is given but the simple statement of Mr. Langstaff, that, "On making a section of the bone, it was evident that there had been a fracture of the neck within the capsular ligament, and that union had taken place by osseous and cartilaginous media." In all cases of controversy, the public have the right to know the reasons upon which an opinion is founded, especially if they are called upon to believe that opinion. In this particular case, it was of the utmost importance that, instead of mere assertion, a systematic statement of the case should have been given, with measurements from certain fixed points, and minute descriptions of the various abnormal peculiarities; that, from these measurements and descriptions, logical conclusions might have been drawn.

Mr. Langstaff makes the statement that the head of the bone was united to the shaft by bone, and that the neck was absorbed. The same objection exists to this which did to his first statement; he gives us none of the reasons whereby he came to the conclusion that this was the head of the bone which remained; he does not inform us whether the ligamentum teres was attached to it or not; he does not mention whether the vessels of the ligamentum teres were enlarged or not, as they would be had they sustained the head of the bone, and also furnished the osseous union existing. In fine, the notes are so carelessly taken, that he does not mention whether there was a ligamentum teres or not. There is no ligamentum teres represented in the engraving; it is presumed that the engraving is a fair representation of the specimen,—for it is presented for that purpose by Mr. Smith. As nothing is said of a ligamentum teres, and none is shown in the plate that represents the specimen, it is right to conclude there was no ligamentum teres. This was probably a case of the absorption of the head of the bone, from the results of the injury. This is rendered probable from analogy and from the facts in the case. Illustrations of this absorption of the head of the bone are abundant; we find them in this same article of Mr. Smith's, page 71, Case 6. (Esther Christie.) In that case we are told: "The upper fragment has been absorbed as far as the acetabulum, and the ligamentum teres was the sole remaining attachment of the bone."

Here the process of absorption of the fractured head of the bone is going on, the head of the bone is absorbed as far as the acetabulum, while the surface of the lower fragment is becoming "*covered with a fibrous deposit, though still rough,*" to enable it to fulfill its new function. Case 7, page 72 (Mary Lamb), gives the same process of absorption going on. In this case, the patient died twelve months after the injury, yet the head of the bone is absorbed as far as the acetabulum, and fibrous structure formed, all of which had been accomplished in the space of twelve months. If, in this old woman, eighty years of age, absorption had gone on as rapidly as here stated, is it improbable that the whole head of the bone should have been absorbed in the case of Mr. Langstaff, when the patient lived, not merely twelve months after the injury, but nearly eleven years, and was only fifty years of age instead of eighty? If further illustrations of this absorption of the head of the bone were desired they could easily be multiplied. The case of Dr. Wm. H. Van Buren's is in point; in that the ligamentum teres was absorbed besides the process in the head of the bone. The case of the girl M. J., under Dr. Wood's charge, is another case in point. There is still another specimen in the museum of Dr. James R. Wood, that illustrates this point; it was taken from a woman fifty-four years of age; all the usual signs of fracture were fully made out; the limb was immediately placed on a double inclined plane, and retained so for nearly two months; the woman had no control over the motions of the limb, she was unable to walk without a crutch, and when she died, two years after the occurrence of the injury, the specimen came into Dr. Wood's possession. At his clinical lecture at Bellevue Hospital, Saturday, January 3, Dr. Wood exhibited the specimen to the students. The patient, he stated, died of pneumonia two years after the injury. The autopsy exhibited the fracture entirely within the capsule; on cutting into the thickened capsule, the head of the bone was *found lying loose in the cavity*; the ligamentum teres was *entirely absorbed*; the head of the bone had become exceedingly light and soft, easily broken up with the handle of a scalpel, the neck of the bone was becoming rounded off to fulfill its new function, and the neck was becoming covered with fibrous matter. These cases demonstrate conclusively the fact that, in fractures of the cervix femoris within the capsule, the head is often undergoing the process of absorption, and it is not unreasonable to conclude that, in this patient of Mr. Langstaff, where she

lived for so long a time after the injury, this process was completed.

In the case of Mr. Langstaff's, the patient was confined to her bed for twelve months, and lived ten years, during which she was lame; if the head of the bone remained, as is claimed, and the union was by bone, if the ligamentum teres remained, as it must have done to have produced this bony union, then the patient should have had the use of the limb; but, on the contrary, she was lame for life—so lame that she had to walk with crutches, though she lived for a period of nearly eleven years after the injury; a circumstance easily understood, if this process of absorption of the head of the bone was going on during this time.

The next case adduced by Mr. Smith to support this view, is that of Dr. Brulatour, page 58 of Mr. Smith's work; also, vol. 13, page 512, *Med. Chirurg. Transactions*.

Dr. James, an English physician, residing at Bordeaux, æt. 47 years, was thrown from his horse, on March 29, 1826. He fell directly on the great trochanter, but got up and walked a step or two, which occasioned such acute pain in the hip joint that he instantly fell again; on examination immediately after the accident, Dr. Brulatour observed the principal signs of fracture of the neck of the femur, such as shortening of the affected limb, eversion of the foot, and a feeling of crepitation in the joint when counter extension was made; extension of the limb was kept up for two months, so as to preserve it of its natural length. Three months after the receipt of the injury, Dr. James was able to walk with only the assistance of a cane, and subsequently recovered the full use of the limb. On the 20th of December, nine months after the accident, he was attacked with hæmatemesis, which proved fatal in two days. The post-mortem examination of the right hip joint showed the capsule a little thickened; the cotyloid cavity and inter-articular ligament in a natural state; the neck of the femur shortened; an irregular line surrounding the neck, denoting the direction of the fracture, and considerable bony deposit at the bottom of the head of the femur, and at the external and posterior part. A section of the head of the femur was made, in a line drawn from its center to the bottom of the great trochanter, so as perfectly to expose the callus. The line of union, indicated by the callus, was smooth and polished as ivory; the line of callus denoted also, that the bottom of the head of the femur had been broken off at its superior and posterior part.

If these notes prove anything, they prove too much; for it is stated that "an irregular line surrounding the neck, denoting the direction of the fracture, and considerable bony deposit at its external and posterior part." "The line of callus, denoted, also, that the bottom of the head of the femur had been broken at its superior and posterior part." If this statement is true, what must have been the nature of the injury? Evidently a comminuted fracture entirely within the capsule; for, the first line denoted that the head of the bone had been fractured off from the shaft of the bone, a second line indicated that the bottom and posterior part of the head had been fractured off from the remainder. If the periosteum was injured, and I can not imagine it to be otherwise, how would it be possible that this third portion of the bone should be nourished? If the head was nourished by the ligamentum teres, and the portion connected with the shaft by the nutrient artery of the femur, how would this third piece be sustained? Yet it had been nourished, and was united to the remainder "by callus as smooth and polished as ivory." Another point: the report states that "the ligamentum teres was in a natural state," and we are informed that the head of the bone was fractured off in such a way, that the larger part of it could only be nourished by the ligamentum teres. The ligamentum teres had in addition to its usual functions nourished this, and had assisted in the formation of the existing callus. When an artery performs an additional function, that artery becomes enlarged. This is constantly seen in the anastomotic circulation of a ligated vessel—the inosculating branches soon enlarge to the size almost of the original vessels, whose place they have supplied. In this case the vessels of the ligamentum teres had to perform their own functions, and in addition to nourish this fractured head, and assist in the formation of callus, yet they were found in a natural state. We may add that Mr. Smith is in error in stating that "It is highly probable that they have *all* been examples of *impacted fractures*;" "the displacement of fragments has been prevented;" for in this case the limb was at first shortened, and then by dressings drawn down to its natural length.

The third case is that of Mr. Stanley, of which the notes are as follows:—A young man, æt. 18 years, fell from the top of a loaded cart upon his right hip, the injury of which was attended with the following symptoms:—he was wholly una-

ble to move the limb; the thigh was bent to a right angle with the pelvis, and could not be extended; abduction was difficult; the limb was everted; but there was no shortening, nor could crepitus be felt in any motion of the limb. The patient died of what was supposed to be small pox, about three months after the occurrence of the accident. In the examination of the joint after death, the capsule was found thickened, the round ligament uninjured; a line of fracture extended obliquely through the neck of the femur, and entirely within the capsule; the neck of the bone was shortened, and its head approximated to the trochanter major. The fractured surfaces were in the closest apposition, and firmly united nearly in their whole extent by bone; there was an irregular deposition of bone upon the neck of the femur, beneath its synovial and periosteal covering, along the line of the fracture. At the end of his report, page 59, Mr. Smith refers to the *Medico-Chirurgical Transactions*, vol. 18. On reference to this volume, we find the following important facts which Mr. Smith has omitted in his extract:—"The age of the patient was unfavorable to the occurrence of a fracture at the neck of the thigh bone. The general opinion, therefore, of the several surgeons to whose judgment the case was submitted, favored a belief of a dislocation into the foramen ovale. Forcible extension of the limb was made by pulleys, and the thigh then moved in several directions by which the head of the bone might be replaced in its socket." These facts which Mr. Smith has omitted, bear directly against the position he has assumed. For immediately after giving the seven cases, of which this is one, he says (page 64) "The preceding cases furnish ample evidence of the possibility of osseous union in cases of intra-capsular fracture of the neck of the femur, and it is highly probable that they have *all* been examples of impacted fractures. Certainly, in all those of which delineations have been given, there has been either penetration of one fragment by a portion of the other, or else the irregularity of the line of fracture has been such, that the displacement of the fragments has been prevented. They have been maintained in contact and at rest, and it is under such circumstances alone, that we are to hope for the occurrence of bony consolidation." These are singular comments upon a case in which the limb was forcibly extended by pulleys, and then rocked. If this was a case of impacted fracture, how long would it remain so, after forcible extension by pulleys and rocking? Yet, according to Mr. Smith,

it must have remained an impacted fracture ; for under those circumstances alone, does he believe we are to hope for bony union.

To an intelligent surgeon, it will be a sufficient refutation of Mr. Smith's assumptions, by simply stating the following facts. The case was at first treated for a dislocation, and not till the second month was the patient brought to the hospital. Shortly after his admission, he was attacked with an exanthem of which he died. Is it probable that a fracture within the capsule of the cervix femoris, mistaken for dislocation, would have that perfect contact and rest (a *sine qua non* of ossificunion with Mr. Smith), without which we can not hope for bony consolidation, when the limb is first forcibly extended by pulleys and rocked, then the patient is removed to a hospital, where he soon after dies from an attack of acute disease, and all this occurring within the space of three months, from the injury ?

Case 4—(Mr. Swan's case).—Mr. Smith's notes are as follows:—"Mrs. Powel, above 80 years of age, fell down, November 14, 1824. Sir Astley Cooper, who saw her soon after, believed that there was a fracture of the neck of the femur, although there was no appreciable shortening of the limb, and only a slight inclination of the toes outward ; crepitus could not be perceived ; the patient died about five weeks after the accident ; upon examination of the joint after death, the fracture was found to have been entirely within the capsular ligament, and the greater part of it was firmly united. A section was made through the fractured part, and a faint white line was seen in one portion of the union, but the rest appeared entirely of bone. The cervical ligament had not been injured." (Smith, page 59.) In this case, the patient was an old lady, above 80 years of age, with the fracture not certainly made out ; there was no appreciable shortening of the limb ; no crepitus ; and only a slight inclination of the toes outward. The strongest point in favor of there having been a fracture, was the opinion of Sir Astley Cooper, which opinion is entitled to great weight ; but there are no satisfactory facts given upon which he formed that opinion. This slight eversion of the foot might be given by the patient to relieve the tension on the bruised and inflamed part. We may well query if the vessels of the ligamentum teres would not have shown evidences of having performed an increased function ? Would five weeks have been sufficient time for them to furnish osseous union, and resume their original size ?

Again, the old woman died in five weeks after the receipt of the injury. Now, it seems to us quite improbable, nay, impossible, that bony union of an intra-capsular fracture of the femur in an old woman, above eighty years of age, in whom *there was not left vitality enough to sustain life*, should take place in five weeks after the injury—in less time than is allowed for the ordinary union of a fracture of the shaft of the femur in a healthy person in the prime of life.

Case 5—(Mr. Adams' case).—This case is reported more fully and is accompanied with an engraving, illustrating it, page 61. The engraving must be considered correct—for it is fair to presume that it would not be made to represent the case any more unfavorable to the side of the question Mr. Smith argues than the facts in the case required. Now, this engraving shows the line of union to extend nearly to the base of the trochanter minor, a point far without the capsule. (See second engraving, on page 61, SMITH on *Fractures*.) This makes it a case of fracture partly within and partly without the capsule—a class of fractures which every one admits may readily unite by bone.

Case 6—(Mr. Jones' case).—Of this case Mr. Smith makes the remark, page 63: "this specimen was sent to Sir Astley Cooper for examination; Sir Astley was of opinion, that the fracture was 'in part within, and in part external to, the capsular ligament; in part united, and in part not; and the neck of the thigh bone absorbed.'" This excludes it from the class of intra-capsular fractures.

Case 7—(Mr. Chonly's case).—Mr. Smith says of this case, "A portion of the upper fragment extended in one situation, a little external to the capsule, this portion was not united." Mr. Smith adduces this to prove that intra-capsular fractures unite, and yet admits it does not belong to the class, and is not an intra-capsular fracture.

This completes the specimens adduced by Mr. Smith, to prove this ossific union of intra-capsular fractures of the cervix femoris. It will be remembered these are not the specimens of one country alone, but the choice specimens culled from the museums of all Europe. In this country, the largest number of specimens are in the possession of Prof. Mussey, of Cincinnati. He claims to have three specimens which prove this.

Of these three, the most valuable one is that about which Prof. Mussey and Dr. Dalton, of Lowell, Mass., maintained so long a controversy. The circumstances of the case, as far

as we have been able to gather them from Prof. Farker's lecture, and from the statements of Dr. Morrell, of Borodino, N. Y., who was one of Prof. Mussey's students shortly after the controversy, are as follows:—The patient was a teamster, away from his home in Northern New Hampshire when he met with the accident; Dr. Dalton became satisfied there was a fracture, and treated him for it. The man became dissatisfied. Dr. Dalton boxed up the leg and sent the man home, a distance of more than one hundred miles, in one of the ordinary country wagons, over the rough roads of that hilly country; on his arrival home, the man's limb was examined by Prof. Mussey, about three weeks after the injury, the dressings removed, yet no fracture could be found; Prof. Mussey maintained this opinion till he came in possession of the specimen, which he thought showed conclusively there was a fracture within the capsule, and which had united by bone, when he made the *amende honorable*. If we had only these facts to rely upon, they would be sufficient to throw a doubt on the nature of the injury. No matter how skillful the surgeon might have been, or how favorable the circumstances surrounding the patient, it would have been impossible to have obtained an union of a fracture entirely within the capsule in four weeks' time. Dr. Dalton may have boxed up the limb in the most skillful manner, and he is a surgeon of high repute in Eastern Massachusetts, yet, it would have been impossible to have applied his pressure so equally as to keep the head of the femur still—jolted, as the man must have been, in one of those old-fashioned, springless wagons; over the half-built mountainous roads of Northern New Hampshire, for a distance of a hundred miles—and yet have, at the end of that journey, an union of an intra-capsular fracture, so perfect that Prof. Mussey denied there ever had been a fracture there.

But these are not the only facts in the case; Dr. Blackman (editor of *VELPEAU'S Operative Surgery*), has given us the true explanation of the case. In his review of *MALGAINE on Fractures*, while discussing this question of intra-capsular fractures, states (*New York Journal of Medicine*, Sept., 1855,) that Prof. Mussey took this specimen to Sir Astley Cooper, to convince him of the possibility of bony union of intra-capsular fractures; but Sir Astley decided this to be a case of fracture, *partly within and partly without* the capsule.

Of Prof. Mussey's two remaining specimens I have been unable to procure histories. I have conversed with a surgeon

of eminence of this city, who has examined them carefully, and he says they are no more satisfactory than the one already referred to. Dr. Bauer, of Brooklyn, has also recently examined them, and is very strongly of the opinion that they are not specimens of intra-capsular fracture.

Since the above was written, we have received the *American Journal of Medical Sciences*, for April, 1857. The leading article is by Prof. Mussey, detailing his cases of "Fracture of the Neck of the Thigh Bone."

We are gratified to find the facts of Case 1, as above stated, corroborated by Prof. Mussey in all essential particulars. In this article, Prof. Mussey admits his inability to convince Sir Astley. He details his interview as follows:—

"On my presenting it for inspection to Sir Astley Cooper, he remarked, 'this bone never was broken,' I said, 'Sir Astley, please to look at the interior of the bone;' he separated the two halves and said, 'this does look a little more like it to be sure, but I do not think it is wholly within the capsular ligament.' It is well known that Sir Astley Cooper, for some years, had taught the doctrine that bony union does not take place in intra-capsular fracture; his views, among the surgeons of Great Britain, were extensively admitted as correct."

This last remark, following, as it does, his account of his interview with Sir Astley, would appear to be Prof. Mussey's assigned reason for his own success.

It is possible that Sir Astley Cooper was so prejudiced as not to admit as facts, points that, at best, were but *doubtful*, but it will hardly be presumed that Sir Astley Cooper would deny facts *about which there could be no reasonable doubt*. This is not the only occasion in which Sir Astley's motives have been impugned. A distinguished lecturer of this country has, in his public teachings, declared that Sir Astley Cooper, by teaching this doctrine of the non-union, "had done more harm than he had ever done good in his life," but those who have studied Sir Astley's works, with an unprejudiced mind, would prefer to believe that he lived alone for truth, for science, and his profession.

Sir Astley Cooper is not the only surgeon of distinction whom this specimen has not convinced. Prof. Mussey mentions John Thompson, of Edinburgh, a surgeon of eminence as well as an author of a work upon inflammation, as one who was not convinced by this specimen.

As to Prof. Mussey's sweeping statement:—"The profes-

sional gentlemen of our country, who have examined these specimens, unhesitatingly pronounce this to be a case of union by bone of intra-capsular fracture," if he will take the trouble to ascertain the opinion of many of the New York surgeons, who have examined this specimen, he will find that this assertion will admit of essential modifications.

Prof. Mussey details several other cases in his own and in other's practice—but this is his best specimen. He also makes some valuable suggestions as to the manner of union and his method of measurement. And we refer, with pleasure, those interested to the *American Journal of Medical Sciences*, for April, 1857, for a further elucidation of his views.

In regard to the Philadelphia specimens, my only source of information is the brief notice of them in the new work on Surgery, by Prof. H. H. Smith, of Philadelphia. His statement is as follows (page 399):—"There is in the Wistar and Horner Museum of the University of Pennsylvania, a femur, apparently of an old woman, in which the neck has been fractured near the head, yet, in which complete osseous union, though with some degree of shortening, has taken place. I have, moreover, in my own cabinet a specimen in which the bone has been fractured through the neck near the head, the fragment having slid down beneath its natural position, and the fracture traveled obliquely down the neck, though still within the capsule, splitting it off in the line of the inter-trochanteric ridge. In this case, which must have produced marked shortening of the limb, there is complete osseous union." This report is so exceedingly brief that no inference can be drawn from it, in fact, the writer does not appear to know whether the specimen is from a male or female. If this is true, then he knows nothing of the history of it. He does not give us the direction of the fracture, or a drawing of it, or even a positive statement that it is entirely within the capsule. In regard to his own specimen, he is more explicit; he gives a drawing and shows that the fractured head has slipped down, and even now the line of fracture can be traced to the inter-trochanteric line. If this is so now, it is probable that the end of the fractured bone extended below the capsule in the first place, as in all cases of fracture, where there is not perfect coaptation, the rough points become absorbed. If we allow for this absorption, it would make the end of the bone below the trochanteric line, a point without the capsule, thus excluding it from this class. If we adopt Prof. Smith's view, that this was entirely within, we

meet with an objection ; he states that the head of the bone has slipped down beneath its natural position, and the fracture has traversed it obliquely. This, of course, could not have been an impacted fracture, for in an impacted fracture we should have had the shaft of the bone driven into the cancellated portion of the head—not the head of the bone “slipping down” along the shaft. If this was a case of slipping down of the head, we leave Prof. Smith, of Philadelphia, to controvert the position taken by Mr. Smith, of Dublin, where he says that only *impacted* intra-capsular fractures can have an osseous union.

There remains but one more specimen to examine. This belongs to Prof. Willard Parker, of this city. I am under obligations to Prof. Parker, for his kindness in explaining to me the various points which he considers the case presents. He loaned me the specimen to examine at my leisure, that I might become thoroughly acquainted with all the facts of the case. According to the description of the case given by Prof. Parker, in his lecture, the patient was an old maid, of about sixty years of age, an inmate of the almshouse, of Barnard, Vt. One morning, while going out of doors, she fell striking upon her hip. The doctor in attendance, who did not pretend to be a surgeon, or accurate in his diagnosis, came to the conclusion that there was a fracture. He was of the opinion that he obtained crepitus, accordingly he dressed the limb with the straight splint for six weeks, and at the end of that time found half an inch shortening. The specimen afterwards came into Prof. Parker's possession. The points Prof. Parker relies on to show that this was a fracture, are:—1. The supposed crepitus. 2. A ridge of bone along the inter-trochanteric line, termed the “callus.” 3. The neck of the bone shortened on the outer side one-third of an inch more than on the inner side, this being accounted for on the supposition that it was produced by the position the limb was allowed to retain. 4. No such changes are to be found in the femur of the opposite side, which is pronounced healthy. These specimens were procured four years after the injury. The capsule is entirely gone, and there is nothing to show positively where it was inserted ; a line is pointed out about three lines below the so-called callus, as the line of insertion of the capsule. On examination of the interior of the specimen, there is nothing to indicate the line of fracture ; no callus as is shown on internal examination of other fractures of long bones. There is one point very marked on

the inner edge of the compact structure of the shaft, it is what Sir Astley Cooper terms a "buttress of bone" shooting up from the body into the neck and head, evidently as a support to the head in the new angle which it has assumed, with respect to the shaft. This buttress is formed apparently by the cancellated structure being more compact than in other points. On comparing this specimen with the femur of the well limb, a very marked difference is observable: this line or buttress is stronger, better developed, and is evidently for the purpose of giving support to the head of the bone in this new position. The specimen is far from being satisfactory. If this rough line extending along the inter-trochanteric line, is in reality the line of callus, then it is extremely probable that the fracture was partially *extra-capsular*. For if the capsule extended along the line which runs below this line that is pointed out as the line of fracture, then the insertion of the capsule must have been as low down as the middle of the trochanter minor, an anomaly in regard to insertion of the capsule. If this really was the line of insertion, it is extremely unfortunate that the capsule was not left to show really where it was inserted.

Again, there is no callus on the inside of the bone corresponding to this so-called external callus, but throughout the whole line corresponding to this external "callus," the cancellated structure is perfect. If it should be admitted that crepitus was here obtained, a point which is extremely doubtful, as we have only the opinion of a doctor who practiced many years ago in the small town of Barnard, Vt., a town which now numbers less than two thousand inhabitants,—if it should be admitted on such authority that this was a fracture, still it is by no means established that this was an intra-capsular fracture; for this so-called callus extends along the inter-trochanteric line. The capsule itself is gone, so that it can not be shown positively where it was inserted, and it is probable if there was a fracture, it was partly extra-capsular.

Again, the view which Prof. Parker takes of his specimen conflicts with that taken by Robert W. Smith, of Dublin, on fractures of this class, in his work already quoted. For if there was crepitus, then there must have been motion of one fragment or the other; and if there was motion, then the fracture was not impacted; and it is only this latter class which Mr. Smith contends can unite. My own impression is that there never was a fracture here at all. I think this

is a case of *interstitial* absorption of the neck of the bone; the cause of this absorption being the contusion received by the fall. This view is sustained by analogy. Sir Astley Cooper says this is common in old people; in his work on *Surgery*, vol. 2, pages 314 and 315, Lee's edition, we find the following:—"As the shell becomes thin, ossific matter is deposited on the upper side of the cervix, opposite the edge of the acetabulum, and often a similar portion at its lower part, and thus the strength of the bone is in some degree preserved. This state of things may be frequently seen in very old persons." "When the absorption of the neck proceeds faster than the deposit on the surface, the bone breaks from the slightest cause; and this deposit wears so much the appearance of an united fracture, that it might be easily mistaken for it before the bone thus alters. We sometimes meet with a remarkable buttress shooting up from the shaft of the bone into its head, giving it additional support to that which it receives from the deposit of bone on its external surface."

Mr. Liston, in his *Practical Surgery*, says:—"Gradual shortening of the lower extremity often ensues upon contusions of the hip in persons advanced in life, in consequence of interstitial absorption of the neck of the thigh bone, and alteration of the angle in which it is set upon the shaft. The head of the bone undergoes a change in form; it becomes flattened and expanded, and the cotyloid cavity is made to correspond. This cause of lameness ought to be kept in view. The risk of its occurrence ought to be explained to those who have suffered injury of the hip, and, if possible, it must be prevented."

Mr. Gulliver, in the *Edinburgh Medical and Surgical Journal*, No. 128, July, 1836, *et seq.*, has written very fully on this subject of interstitial absorption; and has adduced cases which we would copy, if our limits would allow. He shows, by his specimens, that the head is enlarged at its lower part; that these cases may occur in young persons; that it is not disease of the joint, from the fact that there is no ankylosis; and that the cartilages are not involved. The cases of John Lynn, J. McGath, and J. Fox, etc., are adduced, and the specimens preserved from autopsies. We have abundant evidence of interstitial absorption occurring from contusion in persons like this old maid, and Mr. Gulliver says this shortening may take place as rapidly as in five or six days. Now, Prof. Parker's specimen corresponds to the facts we have

given:—1. There is a ridge formed along the lower part of the neck, as Sir Astley Cooper states, occurs in these cases of interstitial absorption. 2. There is the buttress of bone shooting up from the shaft into the head as a means of support; this is clearly shown by comparing the two specimens, the one from the well limb, and the one from the contused limb. 3. There was a contusion sufficient for an exciting cause. 4. This occurs in one limb and not in the other, as shown in the case of J. Fox, reported by Gulliver, where one limb was in every respect natural, and in the other interstitial absorption had taken place. This, we believe, is the case in Prof. Parker's specimen. If this specimen is in reality a fracture, it was most probably partly extra-capsular; if not, it was a case of interstitial absorption.

I have thus reviewed all the cases of supposed osseous union. All of them are defective in points of great importance; no one of them places the question beyond a reasonable doubt, and it should be remembered that these are the choice specimens of all Europe and America.

There is a single point more worthy of notice; it is the extreme difficulty there appears to be, in all these specimens, of deciding whether they are intra-capsular, or only partly within. The mere fact that a surgeon of such eminence as Prof. Mussey should have been misled, and should have been so deceived as to take a specimen across the Atlantic, to convince Sir Astley Cooper of the possibility of the ossific union of intra-capsular fractures, by whom it was conclusively shown that he was in error, is sufficient to prove the difficulty of deciding on these specimens. All such specimens should be preserved in the wet state with the capsule still attached, when there could be no doubt of their character.

The argument may be thus summed up:—1. It is absolutely impossible to form a certain and unmistakable diagnosis of all these fractures during the life of the patient. 2. That the probabilities are all against union by bone, from lack of nourishment to the fractured parts of the head, from impossibility of perfect rest, and from synovitis. 3. The argument from the analogy of fractures of the patella, olecranon, etc., is an argument against, instead of for, osseous union. 4. Cases where every circumstance was favorable to union, if any fractures of this kind could unite, yet which failed to unite. 5. The cases given to prove this union not having proved it.

The *treatment* of these cases is obvious. It has been shown that a positive diagnosis can not be formed. It may be a case

of those kinds which do have a bony union. The patient is entitled to the benefit of this chance. If his age and health will permit, the straight splint should be used; while, at the same time, the surgeon should protect himself, by showing the patient and his friends what an unfavorable result there may be. If the fracture is impacted, it should by all means be kept in the impacted state, and all attempts to extend the limb to its proper length should be abstained from.

If the patient is past the prime of life, or of enfeebled constitution, then the double inclined plane splint should be used; and if the patient can not bear that, then simply let the limb rest over a pillow.



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